PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to methods and means for Folding Dough Pieces

We, BAKER PERKINS LIMITED, of Westwood Works, Peterborough, in the County of Northamption, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to methods and means for mechanically folding a unitary elongated sausage-shaped dough piece into a formation suitable for accommodation in a bread tin for the production of what is termed "cross-panned" bread (in which the dough cells are elongated and have their major axes substantially all lying parallel to the minor dimension of the bread tin).

According to the invention an elongated dough piece received from a drum moulder or other suitable source) is caused to travel on a planar path in a direction transverse to its longitudinal axis while lengthwise portions thereof of substantially equal length are caused to experience displacement relative to the other portion or portions such that the dough piece is given a sinuous folded configuration in which the dough piece portions lie in a side-by-side arrangement the plan shape of which corresponds to the plan shape of a bread tin.

Thus, according to one mode of carrying out the invention for a four portion dough piece, the configuration of the dough piece is altered as follows:— 1. The two end portions of the dough piece are bent in towards positions substantially at right angles to the central portions, 2, the central portions of the dough piece are oppositely bent relative to one another about the centre point of the dough piece whereby the dough piece receives a sinuous formation (e.g., of W-form). In carrying out the invention, as set out above, for a three portion dough piece, the configuration of the dough piece is altered as follows:— 1, the two end portions of the dough piece are bent in towards positions substantially at right angles to the central portion but to point in opposite directions, and 2, the central portion is caused to be slewed with respect to the direction of travel thereof while causing the bent-in end portions to approach one another whereby the dough piece receives a N-shaped formation. If necessary thereafter, the sinuously formed (W- or N-shaped) dough piece is finally given a lateral compression so that the side-by-side dough piece portions are contiguous and in substantial parallelism forming a dough piece corresponding in plan to the plan shape of a bread tin. It should be understood, however, that in both the above modes, stage 2, and the subsequent further compression stage described above can take place substantially simultaneously or with an overlapping sequence and that during stage 1, a degree of lateral compression may be applied to the bent-in end portions of the dough piece.

Further according to the invention as set out above for the production of a folded four-portion dough piece, the sequence stages by which the configuration of the dough piece is altered may be effected by 1, moving the dough piece along a path with its length transverse to the direction of movement and causing forces to be applied to the end portions of the dough piece only to cause them to trail behind the central portions so that the end portions are bent back with respect to the central portions, and 2, while continuing the movement of the part-folded dough piece along the path as before, causing the centre of the dough piece to experience a local retardation relative to the central and end portions lying on either side thereof whereby the centre of the dough piece tends to trail with consequent bending-in of the central portions on either side thereof.

For the production of a folded three portion dough piece, according to the invention as set

[*Price 3s.*]

out above, the sequence staged by which the configuration of the dough piece is altered may be effected by 1, moving the dough piece along a path with its length transverse to the direction of movement and causing forces to be applied to the end portions of the dough piece to cause one end portion to advance ahead of the central portion and the other end portion to trail behind the central portion so that the end portions are bent forwardly and backwardly with respect to the central portion, and 2, while continuing the movement of the part-folded dough piece along the path as before, applying a retarding force to the previously advanced end portion and an accelerating force to the previously retarded (trailing) end portion of the part-folded dough piece to cause the centre portion of the part-folded dough piece to slew, while simultaneously causing the end portions to approach one another, so that the folded dough piece assumes an N-shaped configuration.

Apparatus for carrying out the invention as set out in the two preceding paragraphs may comprise a moving conveyor surface, means for feeding an elongated dough piece thereto and transversely thereof at timed intervals, moving surface means, having a speed and direction the same as that of the conveyor, superposed over the central portion of the conveyor and adapted with the conveyor surface to grip the central portion(s) of the dough piece and initially maintain the central portion(s) in undisturbed transverse alignment with the conveyor, during the displacement relative thereto of the end portions. In the case of a folded four-portion dough piece, convergent lateral guides or fences or equivalent means are provided to extend along at least a substantial extent of the superposed moving surface means and adapted to engage the end portions of the dough piece (i.e. those portions not gripped between the superposed surface means and the conveyor) and to retard them so that they trail behind the central portions and are bent back towards positions at right angles to the central portions.

Beyond the superposed surface means a moving drag post or equivalent member is located above the conveyor surface in line with the centre of the dough piece and carried by means which move the post in the same direction as the conveyor surface but at a linear speed slower than the conveyor surface such that the centre point of the part-folded dough piece comes into contact with the more slowly moving drag post and is consequently retarded whereby the centre point of the dough piece is caused to trail and the central and end portions of the dough piece assume a leading position relative to the centre point to bring about a generally sinuous (W-shaped) configuration of the dough piece.

In the case of a folded three-portion dough piece, a pair of driven guide bands are located one at each side of the superposed moving surface means and disposed so that the plane of each band surface is vertical; one band is driven to have a surface speed slower than that of the conveyor so as to retard the end portion of the dough piece in contact therewith to cause it to swing and trail behind the advancing central portion and the other band is driven to have a surface speed faster than that of the conveyor so as to advance the end portion of the dough piece in contact therewith to cause it to swing ahead of the advancing central portion. Both guide bands are disposed so as to converge as viewed in plan so as to maintain contact with the rearward and forward swinging end portions of the dough piece which are caused to approach the centre line of the conveyor and become arranged in parallel therewith. Due to the rearward movement of the one end portion of the dough piece the guide band responsible for the rearward movement need not extend as far as the outfeed end of the superposed moving surface means, but the guide band responsible for advancing the other end portion of the dough piece is required to extend substantially in advance of the outfeed end of the superposed moving surface means since the faster movement of this end portion will cause it to advance ahead of the central portion controlled by the superposed moving surface means. From the first mentioned guide bands the part-folded dough piece is passed by the conveyor to between a second pair of driven guide bands which also converge in the direction of the conveyor movement but which are reversed as to the speed at which they are driven thus, the band of the second pair on the same side of the conveyor centre line as the slower driven band of the first pair is driven faster than the conveyor and the co-operating band of the second pair is driven slower than the conveyor. The effect of this is to cause the centre portion of the dough piece to slew by bringing the leading and trailing ends of the lateral portions of the dough piece into substantial transverse register while causing the lateral portions to approach one another, so that the dough piece assumes an N-shaped formation.

A pair of converging driven band means may also be provided laterally on each side of the conveyor centre line to extend from adjacent the zone of operation of the drag post in the case of the four portion device and from a point beyond the termination of the second pair of guide bands in the case of the three portion device, moving substantially in the same direction and at the same speed as the conveyor for applying lateral pressure to the sinuously (W- or N-shaped) formed dough piece to compress it laterally so that the dough piece portions lies in a closely side-by-side contiguous arrangement in substantial parallelism.

The invention further consists in apparatus according to the preceding paragraph, wherein further continuous surface means moving in

the same direction and at the same speed as the conveyor are superposed over the conveyor between the laterally located converging driven band means (final compression band means) to prevent portions of the dough piece twisting up or lifting during the lateral compression by the convergent band means. In the case of the four portion device the further continuous surface means extend forwardly from within and away from the zone of operation of the drag post so as to prevent portions of the dough piece twisting up or lifting during the central bending thereof about its centre point effected by the drag post.

The folding of the dough piece according to the modes and by means of the apparatus as set out above may be facilitated by "necking" the dough piece at points corresponding to the positions at which the folds between the dough piece portions are to occur so that the dough piece prior to folding treatments is divided up by the "necks" into the required number of equal portions. "Necking" may be effected by means of vanes fitted to the moulder as described in our co-pending British Patent Application No. 19000/54 (Serial No. 794,187).

In the case of a four portion dough piece, the timing of the feeding of dough pieces to the conveyor is synchronised with the cyclic position of the drag post, since the dough piece must arrive at the zone of operation of the drag post not before the drag post has assumed a position in advance thereof so as to be overtaken by the centre of the dough piece. According to one form of the invention, the means for feeding the dough pieces at timed intervals to the conveyor comprise a transverse trough into which the dough piece is first delivered and which has one side in the form of a pivotal flap, which opens to discharge the dough piece onto the conveyor at the appropriate moment which will result in the dough piece reaching the zone of operation of the drag post at the correct timing. To this end the pivoting of the flap is conveniently effected by a rotary cam driven from the means driving the drag post.

The first moving surface means, superposed over the conveyor at the zone wherein the first stage of folding takes place, may comprise an endless band apron carried on a pair of spaced rolls one of which is driven from the main conveyor drive; its width (i.e., transversely of the conveyor) is equal to half the length of the dough piece and being disposed centrally of the conveyor it spans the central portions of the dough piece so that two end portions, each equal to half the central portion, project on either side. The co-acting convergent guides or fences, responsible for retarding the ends of the dough pieces, may be faced with material, such as polytetrafluoroethylene to prevent dough adhesion.

The drag post or equivalent means and the means for driving the same may conveniently comprise a pair of spaced sprocket wheels around which an endless sprocket chain is trained. One of the chain links carries the drag post so that it extends outwardly from the chain, the sprocket wheels being so mounted and/or the length of the drag post being such that the free end of the drag post just clears the surface of the conveyor when the sprocket chain carries the drag post along its active (lower) run. As the drag post reaches the end of its active run, continued movement of the chain link on which it is mounted around the terminal sprocket causes the drag post to lift clear of the dough piece. It is essential that the timing of this operation is such that the drag post must lift clear of the dough piece as the central fold is completed so that severance of the dough piece at the centre is avoided.

The folding of the dough piece into a sinuous (W) formation due to the retardation of the centre of the dough piece effected by the drag post, as described above, and consequent relative movement of the central and lateral portions on either side, is assisted by the convergent lateral moving surface means, which conveniently comprises an endless band, on each side of the feed path, passing round vertical rolls and located close to the surface of the conveyor, the active (inward) runs of the bands being guided to form a convergent throat by means of suitably curved backing plates.

In the accompanying drawings:—

Figure 1 is a schematic perspective view of one form of dough piece folding apparatus according to the present invention

Figure 2 is a diagrammatic plan of the apparatus shown in Figure 1 with some mechanisms omited for clarity,

Figure 3 is a detail on an enlarged scale of an ancillary device for use with the apparatus according to the present invention,

Figure 4 is a detail on an enlarged scale of another ancillary device for use with the apparatus according to the present invention, and

Figure 5 is a diagrammatic plan of another form of dough piece folding apparatus according to the present invention.

In carrying the invention into effect according to one mode, by way of example, with reference to the folding of a dough piece into four portions (see Figures 1 and 2), an elongated dough piece 1 produced by, for example, a drum moulder (not shown) and provided with necks 2, 3 and 4 dividing the dough piece into four lengthwise portions 5, 6, 7 and 8 is delivered to a transverse trough 9 located at or towards one end of a conveyor 10. The trough 19 comprises an inclined fixed plate 11 and a displaceable flap 12 secured to a shaft 13, to one end of which is applied via an arm a spring 14 to urge the flap 12 to assume normally the position shown in Figure 1. At

the other end of the shaft 13 is secured a crank 15 which is coupled by a link 16 to the upper end of a lever 17 pivoted to the fixed structure at 18, such that swing movements of the lever 17 cause or permit trough-opening or trough-closing movements, respectively, of the flap 12. To effect trough-opening movement of the flap 12 at the appropriate times, as described hereafter, a wheel or circular plate 19 has thereon a projecting pin 20 which follows an orbital path as the wheel 19 is rotated, which is intersected by the lever 17 when the flap 12 is in its raised trough-closing position whereby the wheel 19 and pin 20 act as a cam to cause the lever 17 to swing and pivot the flap 12 at the appropriate moment.

When the trough 9 is opened as described above, the necked dough piece 1 is deposited on the surface of the conveyer 10 and is carried forward by it into a first folding zone indicated as A on Figure 2, wherein the two end (lateral) portions 5 and 8 of the dough piece 1 are caused to be bent backwards relative to the centre portions 6 and 7. This manipulation of the dough piece is effected by converging lateral guides or fences 21 with which the end (lateral) portions 5 and 8 of the dough piece engage and as a result are retarded while the dough piece is carried forward by the conveyor 10; the centre portions 6 and 7, however, are maintained in undisturbed transverse alignment and travel at the surface speed of the conveyor 10 by the action of a superposed moving surface means 22 comprising an endless band apron 23 carried on rolls 24 and driven at the surface speed of the conveyor 10, for example, from the conveyor drive as described hereafter. The width of the apron 23 is equal to half the length of the dough piece 1 and by its central disposition it spans the two central portions 6 and 7 of the dough piece leaving the end (lateral) portions 5 and 8 projecting free. The length of the lower run of the apron 23 is substantially that of the first folding zone A. The lateral guides or fences 21 may be faced with a material, such as polytetrafluoroethylene, to prevent dough adhesion.

The lateral guides or fences 21 have extension portions 25 which continue into the next (second) folding zone B (see Figure 2) wherein the centre point 26 (neck 3) of the part-folded dough piece 1 is retarded with respect to the dough-piece portions 5, 6 and 7, 8 lying on either side thereof with the result that the previously aligned central portions 6 and 7 of the dough piece are bent forwards and towards one another so that the dough piece assumes a W-shaped configuration. The bending of the centre portions 6 and 7 tends to draw the lateral portions 5 and 8 inwardly and this is assisted by the guide or fence extensions 25 being slightly convergent

The retardation of the centre point 26 of the dough piece is effected by means of a moving drag-post 27 or equivalent means which is located above the surface of the conveyor 10 in line with the centre point 26 of the dough piece. The drag post 27 is carried by linear drive means which comprises an endless sprocket chain 28 passing around sprocket wheels 29 and 30. The drag post 27 is attached to one of the links of the sprocket chain 28 so that it extends outwardly of the chain and the sprocket wheels 29 are so disposed and/or the length of the drag post 27 is such that the free end of the drag post 27 just clears the surface of the conveyor 10, while the sprocket chain 28 carries the drag post 27 along its active (lower) run. The sprocket chain 28 is driven by one of the sprocket wheels 29 (as described hereafter) so that the linear speed of the drag post 27 is slower than that of the conveyor 10 (and therefore slower than that of the part-folded dough piece 1), so that when the centre point 26 of the dough piece comes into contact with the more slowly moving drag post 27, it is consequently retarded and trails behind the central portions 6 and 7 (and lateral portions 5 and 8) which thereby assume a leading position whereby the dough piece assumes the sinuous (W-shaped) configuration shown in zone B of Figure 2.

As the drag post 27 reaches the end of its active run, continued movement of the chain 28 carries the drag post 27 up and around the sprocket wheel 30 to lift it clear of the dough piece.

It is essential that the timing of the operations in zone B is such that the drag post 27 is lifted clear of the dough piece as the fold about the centre point 26 is completed so that severance of the dough piece at that point is avoided and it is equally essential that the drag post 27 enters its active lap as the centre point 26 of the dough piece 1 arrives below the sprocket wheel 29 so that the desired retardation of the centre point 26 takes place while the drag post 27 is traversing its active run. To this end the drive of the drag post 27 is timed with respect to, not only the speed of the conveyor 10, but also the opening of the trough 9 and the feed of each dough piece 1 onto the conveyor 10 as hereafter described.

While it may be possible in some instances to feed the dough piece as folded in zone B into a bread tin, it is preferred to apply further lateral compression mechanically to the dough piece so that the portions 5, 6 and 7, 8 lie in a side-by-side contiguous and substantially parallel arrangement of generally rectangular shape corresponding in plan to the plan shape of a bread tin. To this end the W-formed folded dough piece, on leaving zone B, passes into a final zone C (see Figure 2) in which the dough piece is further laterally compressed by a pair of convergent, laterally disposed, driven endless bands 31 arranged with their surfaces in the vertical plane and passing around vertical rolls 32 and 33 located with their lower

ends close to the surface of the conveyor 10. The active (inward) runs of the bands 31 are guided by additional rolls 34 (see Figure 2) or curved backing plates 35 (see Figure 1) to form a convergent throat 36 into which the folded dough piece is pressed.

In order to prevent twisting up, lifting or buckling of the folded dough piece under the action of the drag post 27 or during the application of lateral pressure by the convergent bands 31 forming the throat 36, a pair of holding-down aprons (shown only in Figure 1), comprising endless bands 37 mounted on a spaced pair of transverse rolls 38 and 39, are located above the conveyor surface to extend from within the zone of operation of the drag post 27 (zone B) to adjacent or beyond the throat 36, the pair of apron bands 37 being located one each side of the centre line of the conveyor, i.e., one each side of the line of movement of the drag post 27.

In order to effect drive of the various moving parts of the apparatus at the correct synchronism and at the required relative speeds, a chain drive 40 from a common motor 41 extends over a sprocket wheel 42 driving one terminal roll 43 of the conveyor 10, round a sprocket wheel 44 driving the drag post chain sprocket wheel 29, and round a sprocket wheel 45 driving (through spur gearing 46) one of the rolls 24 of the first (zone A) superposed apron 22. The pair of holding-down aprons 37 and the convergent (throat) bands 31 in zone C may also be driven directly or indirectly from the chain 40 via chain 47, shaft 48 and bevel gearing 49 for the throat bands 31 and via a chain drive 50 taken from the shaft 51 of the sprocket wheel 30 of the drag post chain 28 for the aprons 37.

The pivotal flap 12 of the feed trough 9 is, (as described), operated by means of the pin 20 and wheel 19 driven from the shaft 52 of the drag post chain sprocket wheel 29 by chain 53, but the timing of the operation of the feed flap 12 and the drag post 27 can be relatively adjusted either by altering the effective position of the pin 20 on the wheel 19 or by altering the point of attachment of the drag post 27 to its driving chain 28; thus, when shorter dough pieces are being handled, the pieces overtake the drag post 27 after the latter has already travelled forward a suitable distance along its active run.

The dough pieces, after the completion of folding, may be automatically panned, i.e., fed into the bread tins, by rolling them off the end of the conveyor 10 into bread tins (not shown) carried by a conveyor (not shown) situated in line with and below the conveyor 10, the tin feed being controlled by stop means in known manner actuated in timed relationship to the operation of the drag post and feed flap.

In order to prevent the folded dough pieces from turning over as they roll off the end of the conveyor 10 a deflector bar 60 see Figure 3 only, is mounted a short distance beyond the conveyor end on a bracket 61 which provides means for adjusting the position of the deflector bar 60 according to the size of the dough pieces involved.

A further additional mechanism, not shown in Figures 1 and 2 and only in Figure 4, is a dough piece rectifying device. If one end of the dough piece 1 sticks in the trough 9, it may not fall squarely on to the surface of the conveyor 10. To correct this, the rectifying device shown in Figure 4 comprises a pivotal flap 63 preferably curved to correspond with the curvature of the dough piece section and mounted above the surface of the conveyor 10 just beyond the trough 9. The flap 63 is pivoted at 64 and has an arm 65 coupled by a link 66 to an arm 67 extending from the flap 12 of the trough 9 so that when the latter is lowered to release a dough piece, the linkage causes the rectifying flap 63 to swing down momentarily into the path of the dough piece on the conveyor and square it up, thereafter being immediately raised clear of the dough piece by the action of the trough flap 12.

The apparatus, according to the present invention, may alternatively take a form suitable for folding dough pieces of other than four portions, and in Figure 5 there is shown diagrammatically an arrangement for folding a three-portion dough piece. Where the mechanisms are the same or substantially the same as for the four portion dough piece apparatus described with reference to Figures 1 and 2, only brief allusion will be made and the reference numbers are used.

Dough pieces 101 (preferably necked at 102 and 103 to define lengthwise portions 104, 105 and 106) are fed singly to a conveyor 10 and enter a first folding zone A^1. The centre portion 105 comes under the charge of a superposed or moving surface means 22 the counterpart of that shown in Figures 1 and 2. On one side of the means 22 is a driven endless band 107 adapted to engage the end (lateral) portion 104 of the dough piece and on the other side of the means 22 is a driven endless band 108 adapted to engage the end (lateral) portion 106 of the dough piece. The two bands 107 and 108 are arranged to converge as shown, but the band 107 is driven so as to have a surface speed greater than that of the conveyor 10 while the band 108 is driven so as to have a surface speed less than that of the conveyor 10. The effect of the differential surface speeds is to cause portion 104 of the dough piece to be bent forward in advance of the centre portion 105 and portion 106 to be bent backward to trail behind the centre portion 105. Due to the disposition of the portions 104 and 106 when so displaced the band 107 extends to a point in advance of the means 22, while the band 108 terminates short of the end of the means 22.

On leaving folding zone A^1, the part-folded (zig-zag) dough piece is within folding zone B^1, in which it comes under the action of a further pair of driven endless bands 109, 110. Band 109 is driven at a surface speed of less than that of the conveyor 10, while band 110 is driven at a surface speed greater than that of the conveyor 10, i.e., the band speeds are reversed with respect to the preceding bands 107, 108. The effect of the differential speeds in zone B^1 is to retard portion 104 and accelerate portion 106 of the dough piece with the result that the centre portion 105, no longer controlled by the means 22, is caused to slew as shown so that the dough piece assumes a N-shaped configuration as shown in Figure 5. The bands 109, 110 also converge to effect compression of the dough piece and assist the slewing of the centre portion 105.

At the end of zone B^1, the folded dough piece may be loaded direct into a bread tin, or further compressed as described in Figures 1 and 2 in a final zone C.

WHAT WE CLAIM IS:—

1. Method of mechanically folding a unitary elongated sausage-shaped dough piece into formations suitable for accommodation in a bread tin for the purpose indicated comprising causing the dough piece to travel along a path transverse to its longitudinal axis while causing portions of the dough piece of substantially equal length to experience displacement relative to the other portion or portions such that the dough piece is given a sinuous folded configuration and compression such that the dough piece portions lie in side-by-side arrangement the plan shape of which substantially corresponds to the plan shape of a bread tin.

2. Method of mechanically folding a unitary elongated dough piece as claimed in Claim 1 into four portions, wherein the displacement of the dough piece portions comprise bending in the two end portions of the dough piece to- or towards positions substantially at right angles to the two central portions and oppositely bending the central portions relative to one another about the centre point of the dough piece whereby the dough piece receives a sinuous, compressed W-shaped, configuration.

3. Method of mechanically folding a unitary elongated dough piece into four portions as claimed in Claim 2, wherein the two end portions of the dough piece are bent in while the disposition and alignment of the two central portions are maintained undisturbed, the bending of the central portions about the centre point of the dough piece taking place subsequently.

4. Method of mechanically folding a unitary elongated dough piece as claimed in Claim 1 into three portions, wherein the displacement of the dough piece portions comprise bending in the two end portions of the dough piece to or towards positions substantialy at right angles to the central portion but pointing in opposite directions and causing the central portion to be slewed with respect to the direction of travel of the dough piece while causing the bent-in end portions to approach one another whereby the dough piece receives a sinuous compressed, N-shaped configuration.

5. Method of mechanically folding a unitary elongated dough piece as claimed in any of the preceding claims, wherein the dough piece is first folded into sinuous configuration and is then given a lateral compression so that the side-by-side dough piece portions are contiguous and in substantial parallelism.

6. A method of mechanically folding a unitary elongated dough piece as claimed in any of the preceding claims, wherein the bending of the dough piece portions is effected by retarding or accelerating the movement of one or more of the lengthwise portions with respect to the movement of the other portion or portions.

7. Method of mechanically folding a unitary elongated dough piece as claimed in any of the preceding claims, wherein the folded, or part-folded dough piece or portions thereof are restrained from movement out of the planar path travel of the dough piece.

8. Method of mechanically folding a unitary elongated dough piece as claimed in Claim 6 or 7 into four portions comprising applying forces to the end portions only of the dough piece to cause them to trail behind the central portions so that the end portions are bent backwardly with respect to the central portions and, thereafter, causing the centre point of the dough piece to experience a local retardation relative to the central and end portions lying on either side thereof whereby the centre point of the dough piece trails with consequent bending-in of the central portions on either side thereof.

9. A method of mechanically folding a unitary elongated dough piece as claimed in Claim 6 or 7, into three portions comprising applying forces to the end portions of the dough piece to cause one end portion to advance ahead of the central portion and the other end portion to trail behind the central portion so that the end portions are bent forwardly and backwardly with respect to the central portion and, thereafter, applying a retarding force to the previously advanced end portion and an accelerating force to the previously retarded (trailing) end portion of the part-folded dough piece to cause the central portion to slew while simultaneously causing the end portions to approach one another so that the folded dough piece assumes a N-shaped configuration.

10. Apparatus for mechanically folding a unitary elongated dough piece into formations suitable for accommodation in a bread tin for the purpose indicated comprising a moving conveyor surface, means for feeding elongated

dough pieces thereto and transversely thereof at time intervals, means for engaging parts of each moving dough piece and for applying thereto accelerating or retarding forces while maintaining the rate of travel of other part(s) of the dough piece whereby lengthwise portions of the dough piece of equal length are relatively displaced such that the dough piece assumes a sinuous configuration, and means for displacing the said other parts of the dough piece relative to said accelerated or retarded parts so that the lengthwise equal portions of the dough piece are further relatively displaced and the dough piece assumes a configuration in which the portions thereof lie in side-by-side arrangement, the plan shape of which corresponds substantially to the plan shape of a bread tin.

11. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 10, whereby the end portions of the dough piece are engaged by accelerating or retarding means while the central portion or portions are maintained as to disposition, alignment and rate of travel.

12, Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 11, wherein moving surface means, having a direction of movement and surface speed the same as that of the converter surface means, are superposed in parallelism with and over the central longitudinal portion of the conveyor surface means and adapted, with the conveyor surface, to grip the central portion or portions of each dough piece and maintain the same in undisturbed transverse alignment and at conveyor surface speed during the displacement relative thereto of the end portions.

13. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 12 into four portions, wherein convergent lateral guides or fences are disposed one on each side of the superposed moving surface means and extend along at least a substantial extent of the superposed means to engage and retard the end portions of the dough piece so that they trail behind the central portions held between the conveyor surface and the superposed means and are bent back towards positions at right angles to the central portions.

14. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 13, wherein beyond the superposed surface means, a moving drag post or equivalent member is located above the conveyor surface in line with the centre point of the dough piece and is carried by means which move the post in the same direction as the conveyor surface but at a slower linear speed such that when the centre point of the dough piece comes into contact with the more slowly moving drag post, the dough piece is retarded at its centre point so that the centre of the dough piece trails and the central and lateral portions of the dough piece assume a leading position relative to the centre point to bring about the required sinuous, W-shaped, configuration of the dough piece.

15. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 14, wherein the drag post is carried projecting from a link of an endless sprocket chain passing around sprocket wheels, one of which is driven so that the drag post traverses its dough piece engaging path in timed relation to the arrival of a dough piece thereat.

16. Apparatus for mechanically folding a unitary elongated dough piece as claimed in any of Claims 10 to 15, wherein the means for feeding dough pieces to the conveyor surface means comprises a trough, into which the dough pieces are first delivered, aligned transversely of the conveyor surface at or adjacent one end thereof, the trough having a displaceable side or sides pivoted flap-wise so that the trough can open to discharge a dough piece on to the conveyor surface, the arrangement being such that the opening of the trough can be timed so as to deposit each dough piece on the moving conveyor surface at the appropriate moment which will result in the folding operations being timed correctly where such is necessary.

17 Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 16, wherein dough piece rectifying means are provided adjacent the conveyor surface after the feed trough and comprise a pivotally-mounted flap, preferably curved to correspond with the curvature of the dough piece section, normally held in a raised position above the conveyor surface but connected by linkage means to the pivotal flap of the trough so that when the trough opens the rectifying flap swings down momentarily into the path of the dough piece fed to the conveyor to rectify the same, the rectifying flap being lifted clear of the dough piece as soon as the trough closes.

18. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 12 into three portions, wherein a pair of driven guide bands are located one at each side of the superposed moving surface means so as to engage the end portions of the dough piece, one band being driven at a surface speed slower than that of the conveyor surface so as to retard the end portion of the dough piece in contact therewith to cause it to swing and trail behind the centre portion and the other band being driven at a surface speed faster than that of the conveyor surface so as to advance the end (lateral) portion of the dough piece in contact therewith to cause it to swing ahead of the centre portion whereby the dough piece assumes a sinuous (zig-zag) configuration.

19. Apparatus for mechanically folding a unitary elongated dough piece as claimed in

Claim 18, wherein a second pair of driven guide bands are disposed in continuation of the first mentioned pair but are reversed as to their surface speeds such that a band of the second pair on the same side of the conveyor centre line as the slower driven band of the first pair is driven at a surface speed greater than that of the conveyor surface and the other band of the second pair is driven at a surface speed slower than that of the conveyor surface whereby the centre portion of the dough piece is caused to slew and impose on the dough piece a N-shaped configuration in which all three portions thereof are in a general side-by-side relationship.

20. Apparatus for mechanically folding a unitary elongated dough piece as claimed in any of Claims 10 to 19, wherein the sinuously folded dough piece is given a final lateral compression so that the side-by-side portions are contiguous and in substantial parallelism.

21. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 20, wherein the final lateral compression is applied by a pair of converging driven bands located one each side of the centre line of the conveyor to provide a throat into which the sinuously folded dough piece is drawn.

22. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 21, wherein a further superposed surface means is provided over and between the pair of convergent (final compression) bands to prevent the dough piece portions twisting up or lifting during the final compression.

23. Apparatus for mechanically folding a unitary elongated dough piece as claimed in Claim 22 and Claim 14 or 15, wherein the further superposed surface means extend over the path of action of the drag post or equivalent means to prevent the dough piece portions twisting up or lifting under the retarding action of the drag post.

24. Methods of mechanically folding a unitary elongated dough piece into formations suitable for accommodation in a bread tin for the purpose indicated substantially as described.

25. Apparatus for mechanically folding a unitary elongated dough piece into formations suitable for accommodating in a bread tin for the purpose indicated substantially as described with reference to the accompanying drawings.

MARKS & CLERK.

PROVISIONAL SPECIFICATION

Improvements in or relating to methods and means for Folding Dough Pieces

We, BAKER PERKINS LIMITED, of Westwood Works, Peterborough, in the County of Northampton, a British Company, do hereby declare this invention to be described in the following statement:—

This invention relates to methods and means for mechanically folding a unitary elongated dough piece into a formation suitable for accommodating in a bread tin the production of what is termed "cross-panned" bread (in which the dough cells are elongated and have their major axes substantially all lying parallel to the minor dimension of the bread tin).

According to the invention an elongated dough piece (received from a drum moulder or other suitable source) is caused to experience in succession relative displacements of the lateral and central portions thereof whereby the configuration of the dough piece is altered sequentially as follows:— 1, the two end (lateral) portions of the dough piece are bent in towards a position substantially at right angles to the central portion(s), 2, the central portions of the dough piece oppositely bent relative to one another whereby the dough piece receives a sinuous formation (e.g. of W-form) and 3, the sinuously formed dough piece is compressed laterally so that the dough piece portions lie in a side-by-side contiguous arrangement in substantial parallelism forming a dough piece of generally rectanguar shape corresponding to the shape of a bread tin. It should be understood, however, that stages 2 and 3 above can take place substantially simultaneously or with an overlapping sequence and that during stage 1, a degree of lateral compression may be applied to the bent-in end portions of the dough piece.

Further, according to the invention as set out above, the sequence stages by which the configuration of the dough piece is altered may be effected by 1, moving the dough piece along a planar path with its length transverse to the direction of movement and causing forces to be applied to the end (lateral) portions of the dough piece only to cause them to trail behind the rate of movement of the central portion(s) so that the end (lateral) portions are bent back with respect to the central portion(s) 2, while continuing the movement of the part folded dough piece as before causing the centre of the dough piece to experience a local retardation relative to the central and lateral portions lying on either side thereof whereby the centre of the dough piece tends to trail with consequent bending-up of the central portions on either side thereof.

Apparatus for carrying out the invention as

set out in the two preceding paragraphs may comprise a moving conveyor surface, means for feeding an elongated dough piece thereto and transversely thereof at timed intervals, moving surface means, having a speed and direction the same as that of the conveyor, superposed over the central portion of the conveyor and adapted with the conveyor surface to grip the central portion(s) of the dough piece and maintain the central portion(s) in undisturbed transverse alignment with the conveyor, convergent lateral guides or fences or equivalent means extending along at least a substantial extent of the superposed moving surface means and adapted to engage the lateral portions of the dough piece (i.e., those portions not gripped between the superposed surface means and the conveyor) and to retard them so that they trail behind the central portion(s) and are bent back towards positions at right angles to the central portions, a moving drag post or equivalent member located above the conveyor surface beyond the superposed surface means and in line with the centre of the dough piece and carried by means which move it in the same direction as the conveyor surface but at a linear speed slower than the conveyor surface such that the centre point of the part folded dough piece comes into contact with the more slowly moving drag post and is consequently retarded whereby the centre of the dough piece trails and the central and lateral portions of the dough piece assume a leading position relative thereto to bring about a generally sinuous (W-shaped) configuration of the dough piece, and converging surface means extending from adjacent the zone of operation of the drag post and moving substantially in the same direction and at the same speed as the conveyor for applying lateral pressure to the sinuously formed dough piece to compress it laterally so that the dough piece portions lie in a side-by-side contiguous arrangement in substantial parallelism.

The invention further consists in apparatus according to the preceding paragraph, wherein continuous surface means moving in the same direction and at the same speed as the conveyor are superposed over the conveyor extending from within and away from the zone of operation of the drag post and between the laterally located conveyor moving surface means to prevent portions of the dough piece twisting up or lifting during the central bending thereof by the drag post and during the lateral compression by the convergent surface means.

The folding of the dough piece according to the method and by means of the apparatus as set out above may be facilitated by "necking" the dough piece at points corresponding to the positions of the lateral and central folds so that the piece prior to folding treatments is divided up by the "necks" into four equal portions, viz. two central and two lateral. "Necking" may be effected by means of vanes fitted to the moulder as described in our co-pending Patent Application No. 19000/54 (Serial No. 794,187).

The timing of the feeding of dough pieces to the conveyor is synchronised with the cyclic position of the drag post, since the dough piece must arrive at the zone of operation of the drag post not before the drag post has assumed a position in advance thereof so as to be overtaken by the centre of the dough piece. According to one form of the invention, the means for feeding the dough pieces at timed intervals to the conveyor comprise a transverse trough into which the dough piece is first delivered and which has one side in the form of a pivotal flap, which opens to discharge the dough piece onto the conveyor at the appropriate moment which will result in the dough piece reaching the zone of operation of the drag post at the correct timing. To this end the pivoting of the flap is conveniently effected by a rotary cam driven from the means driving the drag post.

The first moving surface means, superposed over the conveyor at the zone wherein the first stage of folding takes place, may comprise an endless band apron carried on a pair of spaced rolls one of which is driven from the main conveyor drive: its width (i.e. transversely of the conveyor) is equal to half the length of the dough piece and being disposed centrally of the conveyor it spans the central portion of the dough piece so that two end portions, each equal to half the central portion, project on either side. In order that the apron can exert adequate pressure on the dough piece, without deforming it radially, to grip it as described above against the surface of the conveyor, the lower (active) run of the apron may be backed by a rigid surface such as a plate. The co-acting convergent guides or fences, responsible for retarding the ends of the dough pieces, may be faced with a material, such as polytetrafluorethylene, to prevent dough adhesion.

The drag post or equivalent means and the means for driving the same may conveniently comprise a pair of spaced sprocket wheels around which an endless sprocket chain is trained. One of the chain links carries the drag post so that it extends outwardly from the chain, the sprockets being so mounted and/or the length of the drag post being such that the free end of the drag post just clears the surface of the conveyor when the sprocket chain carries the drag post along its active (lower) lap. As the drag post reaches the end of its active lap, continued movement of the chain link on which it is mounted around the terminal sprocket causes the drag post to lift clear of the dough piece. It is essential that the timing of this operation is such that the drag post must lift clear of the dough piece as the central fold is complete so that severance of the dough piece at the centre is avoided.

The folding of the dough piece into a sinuous W formation due to the retardation of the centre of the dough piece effected by the drag post, as described above, and consequent relative movement of the central and lateral portions on either side, is assisted by the convergent lateral moving surface means, which conveniently comprises an endless band, on each side of the feed path, passing round vertical rolls and located close to the surface of the conveyor, the active (inward) laps of the bands being guided to form a convergent throat by means of suitably curved backing plates.

In order to prevent twisting up, lifting or buckling of the dough piece under the action of the drag post or during the application of lateral pressure by the convergent bands forming the throat, a pair of holding-down aprons, comprising endless bands mounted on a spaced pair of transverse rolls, are located above the conveyor surface to extend from within the zone of operation of the drag post to adjacent or beyond the throat, the pair of aprons being located one each side of the centre line of the conveyor, i.e., one each side of the line of movement of the drag post.

In order to effect drive of the various moving parts of the apparatus at the correct synchronism and at the required relative speeds, a chain drive from a common motor extends over a sprocket wheel driving one terminal roll of the conveyor, round a sprocket wheel driving one of the drag post chain sprocket wheels, and round a sprocket wheel driving one of the rolls of the first (stage 1) superposed apron. The pair of holding-down aprons and the convergent (throat) bands may also be driven directly or indirectly from this chain. The pivotal flap of the feed trough is, (as described), operated by means of a rotary cam driven from the shaft of one of the drag post chain sprocket wheels, but the timing of the operation of the feed flap and the drag post can be relatively adjusted either by altering the position of the rotary cam or by altering the point of attachment of the drag post to its driving chain; thus, when shorter dough pieces are being handled, the pieces overtake the drag post after the latter has already travelled forward a suitable distance along its active lap.

The dough pieces, after the completion of folding, may be automatically panned, i.e., fed into the bread tins, by rolling them off the end of the conveyor into bread tins carried by a conveyor situated in line with and below the folding apparatus conveyor, the tin feed being controlled by stop means actuated in timed relationship to the operation of the drag post and feed flap.

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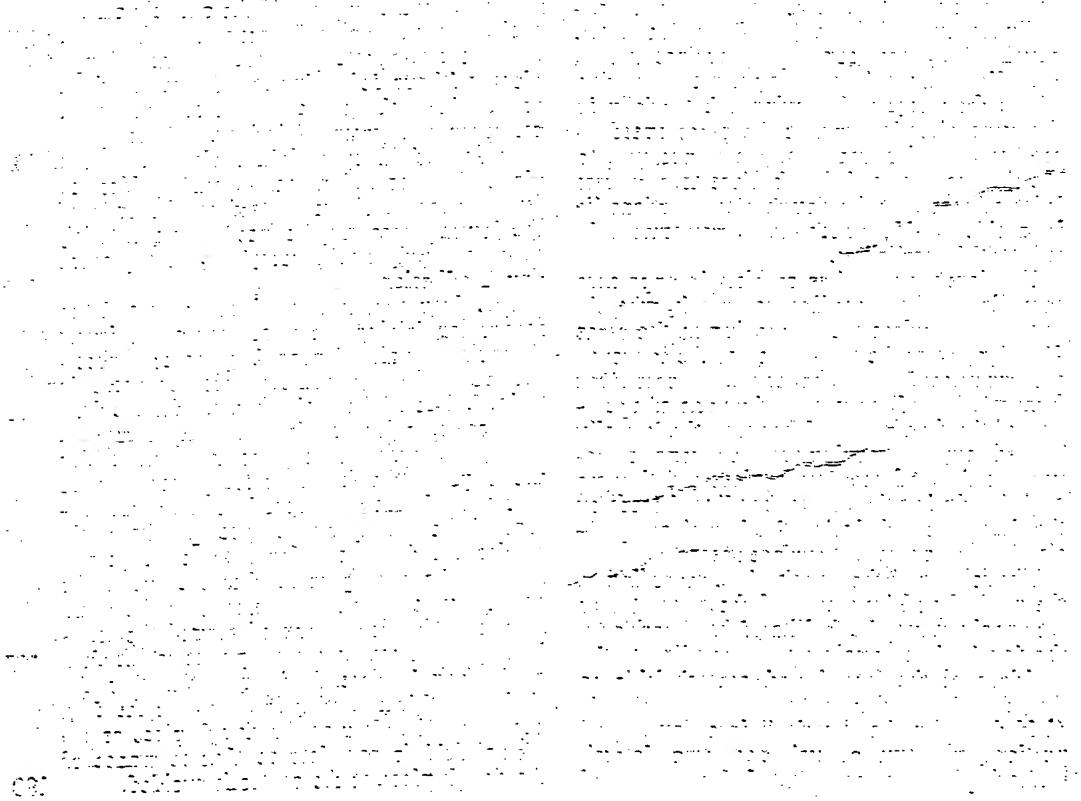

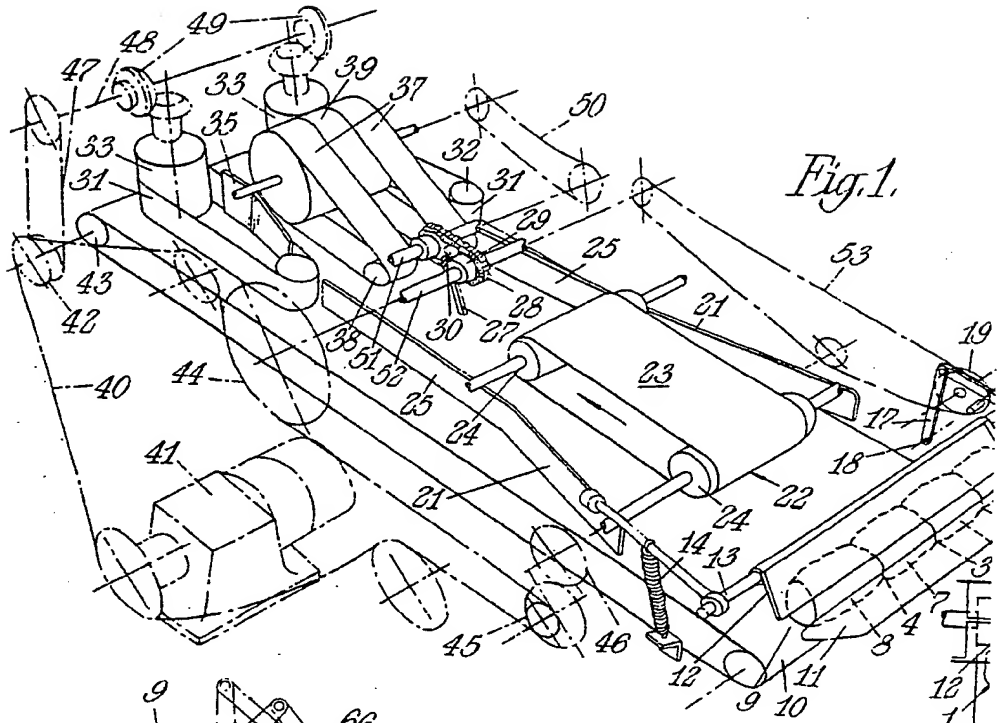

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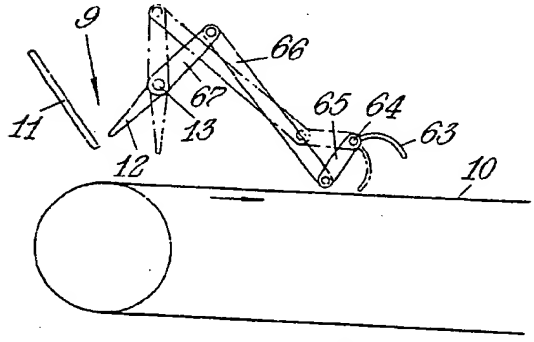

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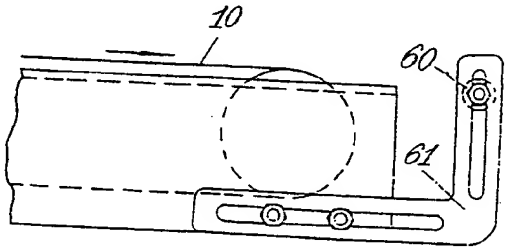
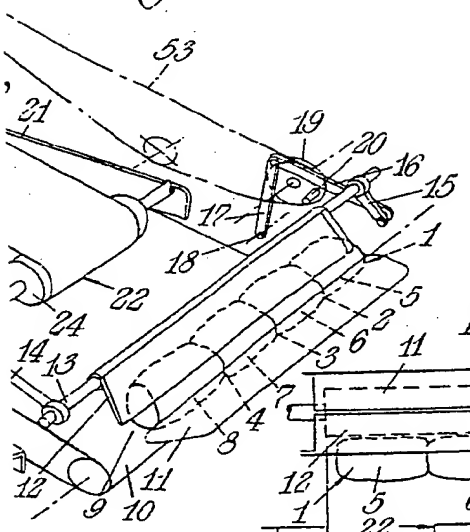


Fig. 3.

835,240 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale.

Fig. 1.



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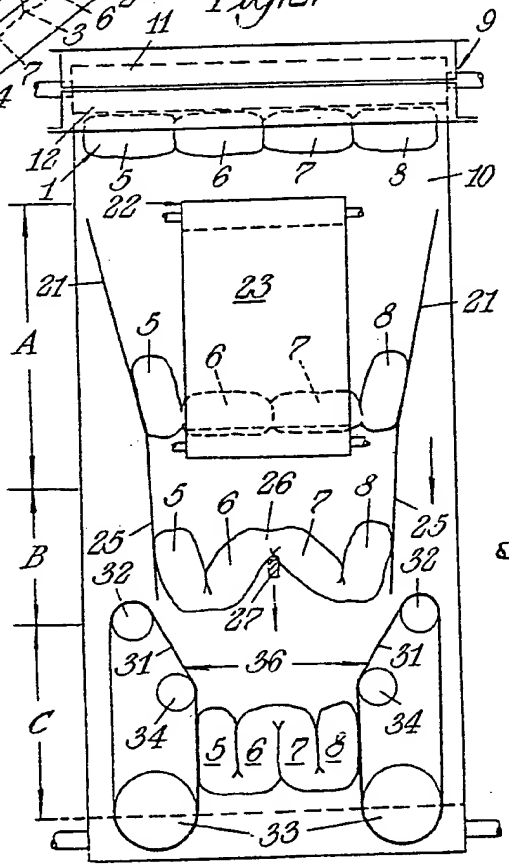

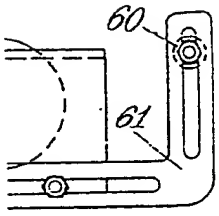

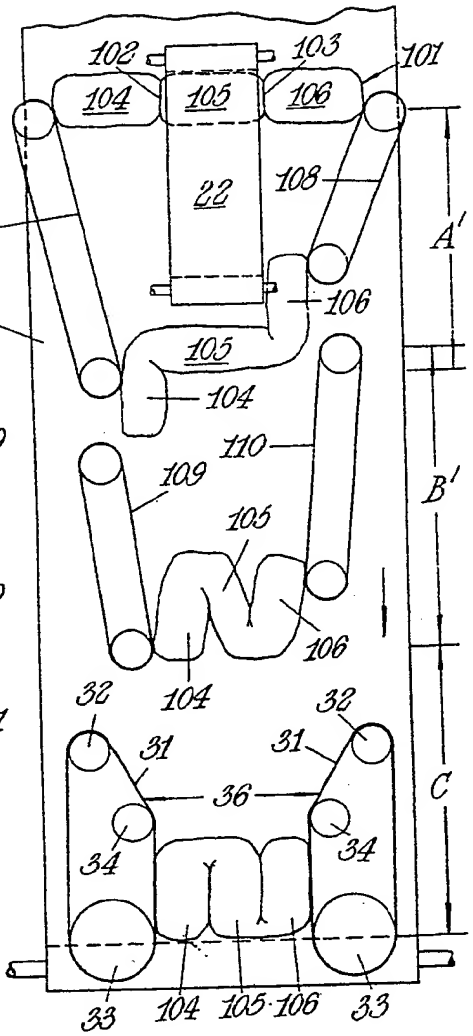

Fig. 5.

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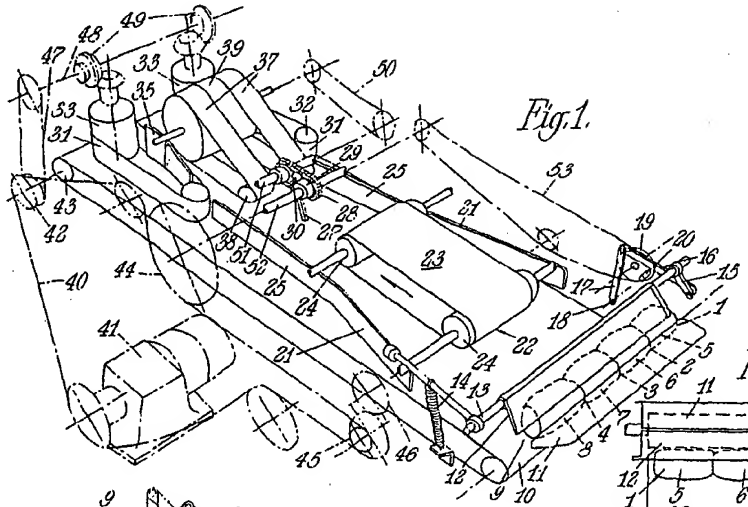

Fig. 1.

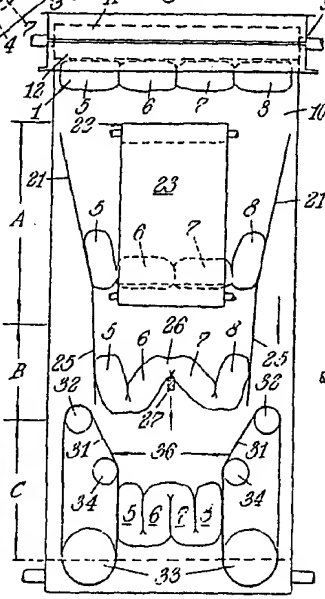

Fig. 2.

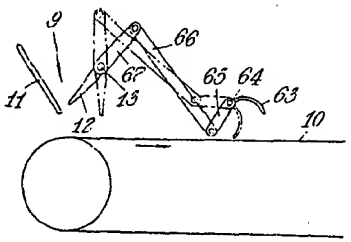

Fig. 4.

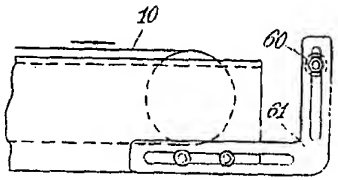

Fig. 3.

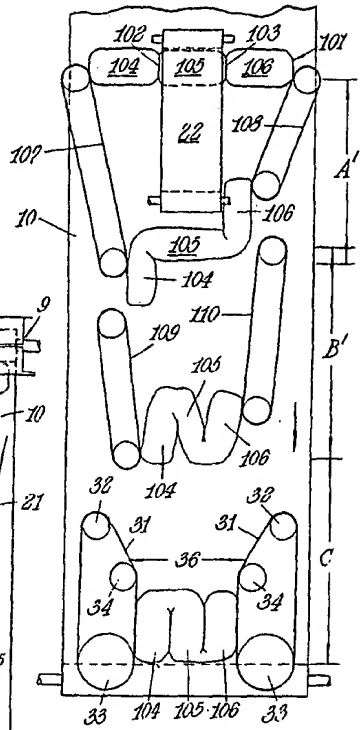

Fig. 5.